The MECLA Dictionary of Carbon

(Prepared on: 17/05/2022)





Introduction

MECLA, the **Materials and Embodied Carbon Leaders' Alliance**, is a collaboration of organisations who have come together to drive reductions in embodied carbon in the building and construction industry. We seek to align with the Paris Agreement targets and principles of the circular economy and recognise that the building and construction sector is a complex ecosystem.

We have a number of Working Groups and through our volunteers across the industry we will address barriers and identify opportunities to:

- Demonstrate demand
- Defining a best practice embodied carbon evaluation framework
- Capture industry case studies that showcase excellent and share this knowledge widely
- Develop a common language for procurement guidelines
- Help manage climate transition risk
- Support the acceleration of the materials supply side

This **MECLA Dictionary of Carbon** provides common language definitions for popular carbon-related terms used in the built environment and related industries. The definitions were developed by MECLA Working Group 4 and have been reviewed by all interested MECLA working group members.

References are included for each definition. The definition used may be directly quoted or may be derived from the reference. Where MECLA has created a unique definition, it is noted.

The definitions are freely available for use by any organisation.

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Glossary

	Definition	Reference
Absolute Zero Carbon	The achievement of zero GHG Emissions without the use of any Carbon Offsets or other compensation mechanisms expressed on a whole-of-life basis or another clearly defined boundary.	(The Instituition of Structural Engineers, 2021)
Adaptive Reuse	Reusing an existing building for a new purpose as an alternative to new construction.	(Guida, 2020)
Australian Carbon Credit Unit (ACCU)	An Australian carbon credit unit as defined under the Carbon *Credits (Carbon Farming Initiative) Act 2011 (Cth)* which is equal to one metric tonne of CO_2-e. Each ACCU issued represents one tonne of carbon dioxide equivalent (tCO_2-e) stored or avoided by a project.	(Clean Energy Regulator, Australian Government, 2020)
Attributable emissions	GHG Emissions from services, materials and energy flows that become the product, make the product and carry the product or service through its life cycle.	(Climate Active, Technical guidance Manual, 2021)
Biodiesel	A liquid fuel derived from vegetable oils or animal fats. Biodiesel has physical properties similar to those of petroleum diesel, but it is a cleaner-burning renewable alternative. Biodiesel can be blended and used in many different concentrations, from B5, which is 95% petroleum diesel and 5% biodiesel, all the way up to B100, which is pure biodiesel.	(Biki, 2021)
Bioethanol	An alcohol used as a blending agent with gasoline to increase octane and cut down emissions. The lifecycle emissions reduction potential of bioethanol is reported to be lower than biodiesel. Bioethanol is generally considered suitable for petrol spark ignition engines used for passenger cars or light-duty applications.	(Bullis, 2006)



	Definition	Reference
Biofuel	An alternative fuel that is developed from biological, natural, and renewable sources. Biofuels are an attractive option due to their high energy density and convenient handling and storage properties. Biofuels can be used on their own (with some precautions or restrictions) or blended with petroleum fuels.	(Demirbas & Demirbas, 2011)
Biogenic Carbon	Carbon removals associated with Carbon Sequestration into biomass, including natural building materials (e.g. timber) as well as any emissions associated with this Carbon Sequestration.	(The Alliance for Sustainable Building Products, 2021)
Burden shifting	Occurs when improvements in one part of the life cycle result in counteracting or negative impacts elsewhere, for example, across different product or service life cycle stages or between countries.	(Jackson & Brander, 2019)
Carbon Capture and Storage (CCS)	Capture, transport and storage of Greenhouse Gases from industrial processes such as fossil fuel power stations, energy-intensive industries, and gas fields by injecting the captured Greenhouse Gases back into the ground for permanent storage.	(Climate Council, 2021)
Carbon Capture and Utilisation (CCU)	The conversion of Greenhouse Gases captured from emissions sources or the atmosphere into valuable lower or zero-emission products.	(CSIRO, 2021)
Carbon Dioxide Equivalents (CO_2-e)	A measure that quantifies the global warming effect of different greenhouse gases in terms of the amount of carbon dioxide that would deliver the same global warming effect.	(Climate Change Authority, 2014)
Carbon Footprint	The total set of GHG Emissions and their impacts caused by an organisation, event or product in a given time frame.	(Carbon Trust, 2009)
Carbon Handprint	For an organisation, it is the reduction of the Carbon Footprint of the organisation's customer or customers, achieved by the provision of the organisation’s products or services. It contrasts with the organisation’s own Carbon Footprint in providing that product or service.	(VTT Technical Research Centre of Finland Ltd, 2016)



	Definition	Reference
Carbon Intensity	The amount of CO_2-e emitted as a unit of production or output e.g. per $ revenue, full-time equivalent or m^2 floor area. Refer also to Greenhouse Gas Intensity	(Baumert, Herzog, & Pershing, 2005)
Carbon Inventory	A measure of the GHG Emissions that are attributable to an activity. A carbon inventory can relate to the emissions of an individual, household, organisation, product, service, event, building or precinct. This can also be known as a carbon footprint or carbon account.	(Climate Active, Technical guidance Manual, 2021)
Carbon Leakage	A policy gap that allows one region to reduce the GHG Emissions which it accounts for by outsourcing manufacturing emissions to another region with less stringent GHG Emissions monitoring and reduction policies.	(Carbon Leadership forum, 2020)
Carbon Mineralisation	The process by which CO_2 becomes a solid mineral, such as a carbonate. It is a chemical reaction that happens when certain rocks are exposed to CO_2.	(USGS, 2019)
Carbon Negative	A city, development, building, or product that goes beyond being Carbon Neutral to intentionally remove CO_2-e from the atmosphere and turns it into useful forms. Also referred to as Carbon Positive.	(Bernoville, 2021)
Carbon Neutral	Having a balance between emitting Greenhouse Gases and absorbing carbon dioxide from the atmosphere in carbon sinks.	(Europa, 2021)
Carbon Neutral Certified	Awarded to organisations, products, services, events, buildings, or precincts that have reached a state of being Carbon Neutral in accordance with a recognised standard. An example of Carbon Neutral Certification is the Australian Government's Climate Active Carbon Neutral Certification programme.	(Climate Neutral, 2021)



	Definition	Reference
Carbon Offsets	An action intended to compensate for the emission of CO2-e into the atmosphere as a result of industrial or other human activity, especially when quantified and traded as part of a commercial scheme.	(Lexico, 2022)
Carbon Reduction Plan / Framework	A government or organisation's plan or framework for achieving the GHG Emissions reductions it has committed to, including actions and milestones.	(UK Government, 2013)
Carbon Positive	See Carbon Negative.	
Carbon Sequestration	The process of removal and storage of CO_2 from the atmosphere in carbon sinks (such as forests, woody plants, algae, kelp, mangroves or soils) or through carbon mineralisation.	(Department for Environment and Water, 2022)
Circular Economy	Circular Economy is based on three principles: design out waste and pollution, keep products and materials in use through refurbishment, reuse and design for adaptation or deconstruction, and regenerate natural systems. The concept of retaining materials at their highest value normally means that embodied carbon invested is also retained and low carbon outcomes are more likely. However, this is not always the case, and it is important to design for outcomes that are both low carbon and circular.	(Ellen Macarthur, 2022) (thinkstep-anz, 2021)
Climate Positive	Climate positive projects provide net positive climate outcomes. They also provide environmental, social, cultural, and economic co-benefits. Over a cradle-to-cradle life cycle assessment they sequester more greenhouse gases than they emit.	(The Australian Institute of Landscape Architects (AILA), 2022)
Climate Positive Development	A development that reduces the emissions it creates and offsets the remainder by removing emissions from adjacent communities. Also referred to as a Climate Positive outcome. Programme developed by the C40 Cities Climate Leadership Group, in partnership with the Clinton Climate Initiative (CCI), and the U.S. Green Building Council.	(CLIMATE+)



	Definition	Reference
Cradle to Cradle	In respect of LCA, the boundary for a full LCA, when a product is completely reused and/or recycled at the end of life. In respect of design, a circular design concept that requires a product to be made in a way that allows for end-of-life reuse and/or recycling.	(Hauschild, Rosenbaum, & Olsen, 2017)
Cradle to Gate	The scope of measurement of impacts in an LCA or Carbon Footprint from raw material acquisition to a finished product at the exit gate of the manufacturing facility.	(C. Cao, 2017)
Cradle to Grave	The scope of measurement of impacts in an LCA or Carbon Footprint across the entire lifespan of the product, from raw material acquisition through to final disposal, reuse or recycling.	(C. Cao, 2017)
Demolition Carbon	The GHG Emissions necessary to demolish and dispose of a building at the end of its life. (Modules C1-C4 in Figure 1.)	(C. Cao, 2017) (UCL Engineering)
Embodied Carbon	GHG Emissions associated with materials and construction processes throughout the whole life cycle of a building or infrastructure being the sum of upfront embodied carbon, in-use embodied carbon, and end-of-life embodied carbon, measured by CO_2-e.	(World Green Building Council, 2019)
Embodied In-Use Carbon	The emissions caused by embodied emissions of a building or infrastructure, through in-use / operational life cycle phase (Modules B1-B5 in Figure 1.) This does not include operational energy (module B6).	(World Green Building Council, 2019)
Embodied Emissions	See Embodied Carbon	
Embodied Energy	The total energy necessary for an entire product life cycle including raw material extraction, transport, manufacture, assembly, installation, maintenance, repair, disassembly, replacement, deconstruction and/or decomposition. This includes renewable and non-renewable energy. Embodied energy does not correlate to embodied carbon.	(World Green Building Council, 2019)



	Definition	Reference
Embodied Upfront Carbon	The emissions caused in the materials production and construction phases (Modules A1-5 in Figure 1) of the lifecycle before the building or infrastructure begins to be used. In contrast to other categories of emissions listed in the Glossary, these emissions have already been released into the atmosphere before the building is occupied or the infrastructure begins operation.	(World Green Building Council, 2019)
Emission Factors	Emission factors are used to convert a unit of activity into its GHG Emissions equivalent. (e.g.. a factor that specifies the kilograms of GHG Emissions per unit of activity).	(Climate Active, Technical guidance Manual, 2021)
Emissions and Energy Reporting System (EERS)	The system for all reporting under the National Greenhouse and Energy Reporting Act 2007.	(Clean Energy Regulator, Australian Government, 2020)
Emissions Boundary	All the emission sources included and excluded in a carbon account, either at a product, site, organisation, building, precinct, infrastructure or city scale.	(ISO 14040, 2006)
End of Life Carbon	The GHG Emissions associated with the End of Life of a building, infrastructure, product or material. See Demolition Carbon	(World Green Building Council, 2019)
End of life processes	Deconstruction or demolition, transport from site, waste processing and disposal phases of a building, infrastructure product or material's lifecycle (Modules C1-C4 in Figure 1) which occur after it has ceased to be used.	(Designing Buildings, 2022)



	Definition	Reference
Environment Product Declaration (EPD)	An independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impact of products and services in a credible way. An EPD is compliant with the standard ISO 14025 and is known as a Type III environmental declaration. Many compliant EPD schemes exist globally. See Carbon Footprint	(EPD International, 2022)
GHG Emissions	All emissions of Greenhouse Gases.	(World Green Building Council, 2019)
'Green' materials	'An environmental claim that is often used informally. The use of 'green' claims for materials (aluminium, concrete, steel, etc) is not recommended. While 'green' materials terms are often used informally, particular care is required in using such terms in a business context. To ensure compliance with Australian Consumer Law, environmental claims must be accurate, clear and able to be substantiated.	(MECLA) (Australian Competition and Consumer Commission, 2022)
Greenhouse Gases (GHG)	Greenhouse gases are those gaseous constituents of the atmosphere, from both natural and anthropogenic sources, which contribute to the greenhouse effect, as detailed in the IPCC Glossary. GHG emissions are often referred to as 'carbon emissions' in general usage.	(IPCC, 2018)
Greenhouse Gas Intensity	For a product, the total GHG Emissions released in energy consumption for production and overhead, GHG Emissions released by transport used for business travel and additional GHG Emissions from the production process divided by the value of the product (i.e. the total factory gate price). Refer also to Carbon Intensity.	(OECD, 2022)



	Definition	Reference
Initial Embodied Energy	The energy, whether derived from fossil fuel or renewable sources, required to initially produce the building or infrastructure including the energy used for the abstraction, processing, manufacture, transport and assembly of the materials of the building or infrastructure. It is different to the Embodied Energy of the building or infrastructure.	(McAlinden, 2015)
Life Cycle Assessment	An analysis of the environmental and/or social impacts of a product, process or a service for its entire life cycle. It looks at the raw material extraction, production, manufacture, distribution, use and disposal of a product. Also known as Life Cycle Analysis.	(ISO 14044, 2006)
Life Cycle Engineering	Sustainability-oriented engineering methodology that takes into account the comprehensive technical, environmental, and economic impacts of decisions within the product life cycle.	(Hauschild M. , 2018)
Life Cycle Inventory	An inventory of input and output flows for a product system over its entire life cycle.	(ISO 14044, 2006)
Life Cycle Stages	Defined stages throughout the life cycle of a building or infrastructure including the product stage, construction process stage, use stage, end of life stage and benefits and loads beyond the building or infrastructure life cycle, as outlined in EN 15978 and illustrated in Figure 1.	(World Green Building Council, 2019) (The Alliance for Sustainable Building Products, 2021)
Low Carbon Materials	Materials that have been produced with a low Embodied Carbon content across life cycle modules A1-A3 (refer to Figure 1) relative to their equivalents in the market. Also known as Low Emission Building Materials.	(NSW Government, 2021)
Low Emission Building Materials	See Low Carbon Materials.	



	Definition	Reference
Net Zero Carbon	A calculated result of zero GHG Emissions, via netting of inward and outward flows of GHG Emissions and carbon offsets or other compensation mechanisms. expressed on a whole-of-life basis or otherwise by reference to clearly expressed boundaries. A net zero definition can be applied across any defined boundary, including a whole life cycle of an asset or product, upfront embodied carbon, operational emissions, etc.	(The Alliance for Sustainable Building Products, 2021)
Operational Carbon	The GHG Emissions associated with energy used to operate the building or infrastructure (Module B6 in Figure 1).	(World Green Building Council, 2019)
Product Category Rule	The requirements for developing Type III EPDs for a group of products that fulfil an equivalent function.	(ISO 14025, 2006) (EPD Australasia, 2018)
Product Life Cycle	The consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal. Comprehensive life cycle analysis considers both upstream and downstream processes. Upstream processes include the extraction and production of raw materials and manufacturing. Downstream processes include product disposal (such as recycling or sending waste to landfill).	(ISO 14040, 2006)
Recurring Embodied Carbon	CO_2-e needed to refurbish and maintain the building over its lifetime (ie. Modules B1-B5 in Figure 1), as distinct from Operational Carbon (Module B6).	(eTool Global, 2022)
Renewable Diesel	A biofuel with similar chemical composition to petroleum diesel, which allows the fuel to be used as a 'drop-in' replacement for fossil diesel without the need for blending.	(U.S. Energy Information Administration, 2020)



	Definition	Reference
Scope 1 Emissions	GHG Emissions released to the atmosphere as a direct result of an activity, or series of activities at a facility level. Scope 1 emissions are sometimes referred to as direct emissions. Examples are: ● emissions produced from manufacturing processes, such as from the manufacture of cement; ● emissions from the burning of diesel fuel in trucks; ● fugitive emissions, such as methane emissions from coal mines; or ● production of electricity by burning coal.	(Clean Energy Regulator, Australian Government, 2021)
Scope 2 Emissions	GHG Emissions released to the atmosphere from the indirect consumption of an energy commodity. For example, 'indirect emissions' come from the use of electricity produced by the burning of coal in another facility. Scope 2 Emissions from one facility are part of the Scope 1 Emissions from another facility.	(Clean Energy Regulator, Australian Government, 2021)
Scope 3 Emissions	Indirect GHG Emissions other than Scope 2 Emissions that are generated in the wider economy. They occur as a consequence of the activities of a facility, but from sources not owned or controlled by that facility's business. Some examples are extraction and production of purchased materials, transportation of purchased fuels, use of sold products and services, and flying on a commercial airline by a person from another business. Also referred to as supply chain emissions.	(Clean Energy Regulator, Australian Government, 2021)
Stewardship Initiative	Product stewardship schemes support the environmentally sound management of products and materials over their life. This includes at the end of their useful life. These arrangements may be voluntary, mandatory, or shared across industry. See Annex A for examples of Stewardship Initiatives.	(Department of Agriculture Water and the Environment, 2021)



	Definition	Reference
Upfront Embodied Carbon	See Embodied Upfront Carbon	
Whole-Life Carbon	The total of all GHG Emissions and removals, both operational and embodied, over the lifecycle of an asset, including its disposal (Modules A–C in Figure 1). Potential benefits or loads from future energy recovery, reuse and recycling are reported separately (Module D)	(The Alliance of Sustainable Building Products, 2021)



Embodied Carbon

Product | Construction | In use | End of life | Beyond Building

A1 Raw material supply
A2 Material transport
A3 Manufacturing
A4 Product transport
A5 Construction & installation

B1 Use
B2 Maintanence
B3 Repair
B4 Replacement
B5 Refurbishment

C1 Deconstruction/demolision
C2 Material transportation
C3 Waste processing
C4 Disposal

D
Benefits & loads
Reuse
Recovery
Recycling

Circular economy

Upfront Carbon

B6 Operational energy
B7 Operational water

Operational Carbon

Whole-life cycle carbon

Cradle to gate
Cradle to practical completion
Cradle to grave
Cradle to cradle

Figure 1: BS EN 15978:2011 Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method - European Standards (en-standard.eu) (amended to include whole-life cycle carbon)



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Annex

A.1. Annex A – Stewardship Initiatives

Several stewardship initiatives exist which are related to products used in the built environment. Relevant initiatives include:

- Aluminium Stewardship Initiative
- ResponsibleSteel
- FSC
- PEFC
- Responsible Wood
- Vinyl Council of Australia
- PaintBack
- Water Stewardship Australia



A.2. Annex B – Standards related to carbon in the built environment

Relevant Standards

ISO 14021	ISO 14021:2016 Environmental labels and declarations — Self-declared environmental claims (Type II environmental labelling)
ISO 14024	ISO 14024:2018 Environmental labels and declarations — Type I environmental labelling — Principles and procedures
ISO 14025	ISO 14025:2006 Environmental labels and declarations — Type III environmental declarations — Principles and procedures
ISO 14040	ISO 14040:2006 Environmental management — Life cycle assessment — Principles and framework
ISO 14044	ISO 14044:2006 Environmental management — Life cycle assessment — Requirements and guidelines
ISO 14067	ISO 14067:2018 Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification
EN 15804	Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
EN 15978	BS EN 15978:2011 Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method
PAS 2050	Publicly Available Specification (PAS) 2050 -. Specification for the assessment of the life cycle greenhouse gas emissions of goods and services
PAS 2060	PAS 2060:2014 Specification for the demonstration of carbon neutrality
PAS 2080	PAS 2080:2016 Carbon management in infrastructure



Applicability and Limitations

This document is introductory in nature and may not be suitable for your intended purpose.

It does not constitute technical, legal or other advice and should not be relied upon as such. You should always obtain your own technical, legal or other advice from a qualified professional based on your specific circumstances before taking any action relating to matters covered by this document.

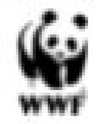
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Materials and Embodied Carbon Leaders' Alliance

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